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PROVISIONAL SPECIFICATION.

Improvements in the Feathering and Sheathing of Steam Ship Propellers, also in Means for Altering the Angle of Propeller Blades.

I, JOHN FERGUSON, of West Pier, Leith, N.B. and 14 St. George's Square, London, S.W., Engineer and Shipbuilder, do hereby declare the nature of this invention to be as follows:—

This invention relates to improvements in the feathering and sheathing of steam ship propellers; also in means for altering the angle of propeller blades and my improvements are applicable to propellers with two, three or more blades.

In the carrying out of my invention I mount or pivot the blades on pins at a distance from the centre of the boss and by a rack and pinion, operated from inboard by a shaft within the main shaft. I cause the blades to fold down from a vertical or outspread position to a fore and aft or feathered position the tips of the blades being drawn closely together. The said shaft within the main shaft may be operated by any suitable screw gear; or by any equivalent mechanical arrangement for operating the inner shaft. Also instead of a rack and pinion within the boss I may employ levers or cams. When in this position the blades are so arranged that they occupy little more space than the boss of the propeller in a fore and aft direction. This being so a recess is constructed in the stern post of the vessel (or at the sides if more convenient or for twin screws) with an orifice large enough to easily take in the propeller boss and of a fore and aft length to take in the length of the blades when feathered. By a screw lever or other arrangement, the engine or other motive power with shafting attached, can then be moved forward a sufficient length to bring the complete propeller blades into the ship and out of sight.

An alternative arrangement is where the engine would be fixed in the ship when it would work into a geared wheel sliding on a keyway on the shaft which would be moved fore and aft by screw, lever or otherwise.

If an alteration in the pitch of the blades was required, this would be effected by a worm or screw motion or projection or cam on the end of the inner sliding shaft in the boss whereby the blades could be turned to vary the angle.

Dated this 20th day of November 1895.

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115 St. Vincent Street, Glasgow, Applicant's Agents.

COMPLETE SPECIFICATION.

Improvements in the Feathering and Sheathing of Steam Ship Propellers, also in Means for Altering the Angle of Propeller Blades.

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I, JOHN FERGUSON, of West Pier, Leith, N.B. and 14 St. George's Square, London S.W. Engineer and Shipbuilder, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in the feathering and sheathing of steam
[Price 8d.]

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ship propellers, and also in the means for altering the angle of the propeller blades, and has for its object to provide a vessel with a propeller which, instead of being immovably fixed in one position at a set distance from the rudder or stern post can be drawn into or towards the body of the ship, so that when the vessel is sailing, moving among ropes, nets *etc.* or in any position where an exposed propeller might be disadvantageous, it is entirely out of sight, offers no hindrance to the progress of the vessel and shews no projection that would catch any object floating or passing alongside. 5

But in order that my invention may be more readily understood and easily carried into effect I will proceed to describe the same with reference to the accompanying drawings in which 10

Figure 1 is an elevation.

Figure 2 a plan.

Figure 3 an end view and

Figure 4 a detail view shewing one method of carrying out my invention. 15

Figure 5 is an elevation and

Figure 6 an end view of a modified form.

Figure 7 is an elevation.

Figure 8 an end view and

Figures 9 and 10 detail views shewing method of altering the pitch of propeller blades. 20

Referring to Figures 1, 2, 3, & 4 of the drawings I mount or pivot the propeller blades A on pins *a* at a distance from the centre of the boss B, the inner ends of the blades being formed with teeth *a*¹ which engage with a rack *a*² formed upon the end of the shaft C which works within the outer shaft *b* whereby upon the pulling forward of the shaft C the blades change from a vertical or outspread position as shewn in Figure 4 to a fore and aft or feathered position as shewn in Figure 1. 25

The shaft *b* after the blades have been feathered is free to be drawn forward within the vessel and thus cause the propeller to enter the aperture D in the stern post of the vessel which in this case is circular, or in the case of twin screws or where deemed advisable corresponding apertures on each side of the ship. 30

In order to operate the inner shaft C which has the rack *a*² formed thereon, I provide the outer shaft *b* within which the shaft C works, with a nut *c* into which the end of the inner shaft C, which is screwed, engages; the said nut *c* is formed with a collar *c*¹ which works in a recess in the outer shaft *b* and is held in position by a plate *c*² so that it is free to be revolved and operate the shaft *b* in either direction as required. 35

For the purpose of drawing the propeller within the aperture in the stern post I employ a sole plate E upon which are mounted two bearings *e* within which the shaft *b* revolves; the shaft being operated by means of a spur or sprocket wheel *e*¹ which is secured to the shaft by means of two keys *e*² which work in slotted keyways *e*³ in such a manner that the shaft is capable of being moved longitudinally while at the same time being revolved by the said wheel *e*¹. 40

The end of the said outer shaft *b* is also mounted within a bearing F which is capable of sliding within guides E¹ upon the sole plate E, and is secured therein by means of two collars *f*. The said bearing F is moved backwards and forwards by a screwed shaft G the one end of which is mounted within the bearing *e* the other end being mounted and secured within the bearing F by a collar *g*¹ and retained by a plate *g*²; the said screw being operated by a hand wheel *g*³. The bearing F when the propeller is in its exposed position is secured by means of two pinching pins E². 45

It will be readily seen from the foregoing that after the blades have been feathered through the medium of the nut *c*, by operating the hand wheel *g*³ the whole propeller can be easily drawn into the aperture D and *vice versa*. 50

Or in place of pivoting the propeller blades I may employ a solid propeller A 55

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as shewn in Figures 5 and 6 fixed immovably upon the shaft *b* so that when desired to sheath this propeller the shaft (which in this case is solid) is simply drawn into the ship by means of the same apparatus as first described thereby causing the propeller to enter the aperture D.

- 5 As this last form of propeller however necessitates a somewhat clumsy form of stern post and aperture I may mount the blades A as shewn in Figs. 7, 8, 9 & 10 within the boss B in such a manner that their inner ends project to nearly the centre of the boss and provide them with teeth a^1 which engage with teeth a^2 formed upon the end of the inner shaft C whereby a rotatory motion is given to the root of each blade which enables the blades, when the propeller is not required, to be placed in a fore & aft position, in which position they can be drawn within the aperture D.

- 15 The arrangement of the teeth a^2 upon the end of the shaft C is such that each blade is operated in the opposite direction to the other thereby enabling the pitch of the blades to be altered as required, and may be employed in cases where the propeller is not required to be drawn in but is always in an exposed position.

In place of forming the end of the shaft with teeth I may employ cams, levers or any other equivalent, both in this case & in the propeller described in Figures 1, 2, 3 & 4.

- 20 Also in place of the apparatus shewn for drawing in the propeller I may employ a clutch, lever, ratchet, hydraulic or any other appliance; or I may mount the engine or other motive power with shafting attached that it can be moved forward a sufficient length to bring the propeller blades into the ship and thus out of sight.

- 25 An object to which this propeller is particularly applicable is the assistance that may be given by their being used as steering engines, in which case one might be placed on each quarter of an ironclad or other unwieldy vessel and with an engine applicable to both, be of the greatest service in pushing round the vessel's stern or bow when manœuvring in confined spaces, especially at slow speeds.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

- 35 1st. The means for feathering and sheathing steam ship propellers and for altering the angle of propeller blades, substantially as hereinbefore described and shown in the accompanying drawings.

- 2nd. In means for feathering and sheathing steam ship propellers, pivoting the propeller blades within the boss whereby they can be feathered by means of a shaft within the outer shaft having a rack which engages with teeth upon the inner ends of the blades and operated by a nut at the end of the shaft, or any other mechanical equivalent, substantially as hereinbefore described and shewn in the accompanying drawings.

- 3rd. In means for feathering and sheathing steam ship propellers, the apparatus for sheathing the propeller after the blades have been feathered substantially as hereinbefore described and shewn in Figures 1 & 2 of the drawings.

- 4th. In means for sheathing steam ship propellers, the employment of a solid propeller fixed immovably upon a solid shaft in combination with the apparatus for sheathing propellers, shewn in Figures 1 & 2 or any other mechanical equivalent of the same, substantially as hereinbefore described and shewn in the accompanying drawings.

- 5th. In means for feathering and sheathing propellers mounting the blades within the boss in such a manner that their pitch can be readily altered by means of a shaft within the outer shaft through the medium of a double ratchet engaging with teeth upon the inner ends of the blades, in combination or not with the apparatus for sheathing the propeller described and shewn in Figures 1 & 2 of

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the drawings or any mechanical equivalent of the same, substantially as herein-
before described and shown in the accompanying drawings.

Dated this 20th day of August 1896.

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